

**REMARKS**

**Present Status of the Application**

The Office Action rejected claims 1, 2, 4-6, 10 and 11 under 35 U.S.C. 103(a) as being unpatentable over Ezoe (JP 10-101371) (hereinafter Ezoe) in view of Hesse (US 2005/0160637) (hereinafter Hesse). The Office Action rejected claim 8 under 35 U.S.C. 103(a) as being unpatentable over Ezoe as applied to claim 4 in view of Kobayashi (US 4,405881) (hereinafter Kobayashi).

Applicants have amended claims 1 and 4 according to line 3 of page 6, line 10 of page 10 and pages 16-18 (descriptions for the examples 5 to 10) of the specification. All changes to the claims are fully supported by the originally filed claims, disclosure and the drawings. For at least the following reasons, Applicant respectfully submits that claims 1-2, 4-6, 8 and 10-11 are in proper condition for allowance. Reconsideration is respectfully requested.

**Discussion of Office Action rejection**

*The Office Action rejected claims 1, 2, 4-6, 10 and 11 under 35 U.S.C. 103(a) as being unpatentable over Ezoe in view of Hesse. The Office Action rejected claim 8 under 35 U.S.C. 103(a) as being unpatentable over Ezoe as applied to claim 4 in view of Kobayashi.*

In response thereto, Applicants traverse these rejections for at least the reasons set forth below.

The features are recited in claim 1. With respect to claim 1, independent claim 1 recites the features as follows:

1. A luminescent glass article, manufactured by sintering a mixture of particles of a glass and a luminescent substance, comprising a structure in which the luminescent substance is dispersed uniformly in the glass, wherein:

**the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%, the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$ ;**

light transmittance is 20 to 90% at a thickness of 10 mm; and  
an initial luminescence intensity just after irradiation of light of 1,000 lux for 20 min is 200 to 4,000 mcd/m<sup>2</sup>.

(Emphasis added)

Claim 4 also recites the similar features.

Ezoe, as shown in paragraph [0021], discloses that “light accumulating phosphor is uniformly dispersed and incorporated into the base material by **3-50wt.%**.” However, present invention disclosed that “**the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%**” Ezoe et al. discloses the content of 3-50 weight% which is out of the claimed range of **1.1 to 2.8** mass% of present invention. In addition, Ezoe states in the paragraph [0021] that if the content of the luminescent substance is less than 3 weight%, the expected luminance intensity can’t be obtained. Ezoe, as shown in paragraph [0025], discloses that “light accumulating phosphor **having an average particle size of 5-20 $\mu\text{m}$** .” However, present invention disclosed that “**the luminescent substance having an average particle size**

**of 500 to 5,000  $\mu\text{m}$ .**” The present invention comprises the luminescent substance less in content while greater in particle size than Ezoe. By employing the luminescent substance having greater particle size, the surface of the luminescent substance may deteriorate due to heat during sintering, but inside thereof is not deteriorated, so that the ratio of the luminescent substance to be deteriorated is reduced. Also the number of particles is smaller than that in a case where the particle size is small, to thereby easily provide light transmittance and high luminescence intensity (see the specification, on page 8, lines 16-22). Thus, according to the present invention, as comparison with employing the luminescent substance having smaller particle size, it can be possible to reduce the content of the luminescent substance while obtaining the equivalent luminescence intensity. Thereby, it can be possible to obtain the luminescent glass having a high mechanical strength since sintering of the glass is not disturbed, and to decrease in the usage of the expensive luminescent substance in order to reduce the production cost.

As shown in Table 1 and 2 and page 12-18 of the specification of present invention, the luminescent glass articles of the examples 5 to 10, in which the content of the luminescent substance is 2.5 mass% and the average particle size of the luminescent substance is 500  $\mu\text{m}$ , are superior in initial luminescence intensity to the luminescent glass articles of the examples 1 to 4, in which the content of the luminescent substance is 2.5 mass% and the average particle size of the luminescent substance is 20  $\mu\text{m}$  or 30 $\mu\text{m}$ . Especially the luminescent glass articles of the examples 5 to 9 has almost the same degree of the initial luminescence intensity as that of the luminescent glass article of the comparative example, in which the content of the luminescent substance is 20 mass% (very large amount) and the average particle size of the luminescent

substance is 20  $\mu\text{m}$ , while having the remarkably improved mechanical strength in comparison with that of the comparative example.

Ezoe fails to disclose that “**the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%, the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$** ” as required by the present invention, as set forth in claims 1 and 4.

Hesse, as shown in paragraph [0005], only discloses that “Size ranging from 10-70 $\mu\text{m}$  particle size are preferably employed”, and does not disclose the content of the luminescent substance. However, present invention disclosed that “**the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$** .” The Office Action asserts that Hesses discloses “the particle size of the luminescent substance ranges from 10 to 70 $\mu\text{m}$ ; and the larger the particle size is, the higher the intensity of luminescence is.” In this regard, Applicants submit that, paragraph [0005] of Hesses discloses that the particle size of the luminescent substance ranges from 10 to 70 $\mu\text{m}$ , and further discloses that the particle size is defined to range from 45 to 65 $\mu\text{m}$  or from 10 to 40 $\mu\text{m}$  for a desired effect. That is to say, Hesses discloses the particle size is defined to be below 70 $\mu\text{m}$  for a desired effect, but fails to expressly disclose the condition that the particle size is defined to be over 70 $\mu\text{m}$ . Furthermore, according to the disclosures of paragraph [0005] of Hesses, the particle size of the luminescent substance needs to be smaller, but the average particle size of the luminescent substance of the present invention ranges from 500 to 5,000  $\mu\text{m}$ , so the particle size of the luminescent substance of the instant case is several times larger than that disclosed in Hesses. Therefore, since Hesses fails to disclose the particle

size of the luminescent substance is several hundreds  $\mu\text{m}$  to several thousands  $\mu\text{m}$ , Hesses actually teaches away from the instant case. Persons of ordinary skill in the art cannot easily think of the results of the instant case based on the disclosures of Hesses. Hesse also fails to disclose that **“the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%, the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$ ”** as required by the present invention, as set forth in claims 1 and 4.

Kobayashi also fails to disclose that **“the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%, the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$ ”** as required by the present invention, as set forth in claims 1 and 4.

For at least the foregoing reasons, Applicants respectfully submit Ezoe, Hesse and Kobayashi fail to teach or suggest the limitations of **“the content of the luminescent substance in the luminescent glass article is 1.1 to 2.8 mass%, the luminescent substance having an average particle size of 500 to 5,000  $\mu\text{m}$ ”**, and thus the references combined do not teach or suggest each and every element claims 1 and 4. Therefore, independent claims 1 and 4 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2, 5-6, 8 and 10-11 patently define over the prior art as a matter of law, because these dependent claims contain all features of their respective independent claims 1 and 4. *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

**CONCLUSION**

For at least the foregoing reasons, it is believed that all the pending claims 1-2, 4-6, 8 and 10-11 of the present application patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Respectfully submitted,  
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